PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventors: ERNST FANGRADT and WINFRID WENZLAFF

1,178,859

1,178,859

Date of Application and filing Complete Specification: 30 Aug., 1967.

No. 39749/67.

Complete Specification Published: 21 Jan., 1970.

Index at acceptance: —H1 B(D1, D8F, D8K, D10C, D12, P1A, P1C, P2A, P3A4, P4A, P4C)

International Classification: —H 01 m 15/02

COMPLETE SPECIFICATION

Air Depolarized Alkaline Cell

We, VEB. BERLINER AKKUMULATOREN- UND ELEMENTEFABRIK, a Corporation organised and existing under the laws of Eastern Germany, of Wilhelminenhofstrasse 68—69, 116 Berlin-Oberschöneweide, Eastern Germany, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an air depolarized alkaline cell. Such cells, when the electrolyte is potassium hydroxide, suffer from the drawback that carbon dioxide from the air may enter, so forming potassium carbonate which crystallises out, obstructing the pores of the carbon electrode and ruining the cell. If the potassium carbonate remains in solution the conductivity of the electrolyte is reduced. The ingress of CO_2 depends on the ratio between the volume and the area of the cell. For this reason, alkaline air depolarized cells, particularly with high capacity values, and also air depolarized cells with neutral salt solutions as the electrolyte, are manufactured as small constructional units so that the energy content thereof is satisfactory at low loadings. Expensive catalysts must be used if the active carbon is to be rendered more effective. The cells have the further disadvantage that special measures have to be taken to ensure that the electrolyte cannot leak out.

Special cells are known, constructed to reduce intake of carbon dioxide and leakage of electrolyte, with a depolariser and an electrolytically reducible compound which emits oxygen, with airtight sealing of the cell, and in which when excess pressure occurs in the cell the gas which forms therein can escape to the outside via a high pressure relief valve. Such structures however, cannot be used in the case of a cell with an activated oxygen electrode and alkaline electrolyte, since the operation of the cell is based on the use of the oxygen of the air as a depolarizer, so that the atmospheric air must have access to the carbon electrode. With these cells it is not possible to determine the moment at which the supply of the air from the atmosphere has to commence, i.e. when the cells are to be put into operation.

The object of the invention is to provide a galvanic air depolarized cell with an alkaline electrolyte and of relatively high capacity, enabling the electrolyte to be largely protected from the deleterious effect of the carbon dioxide of the atmosphere and also prevent the electrolyte from diffusing through the carbon electrode, to prevent the emergence of the electrolyte which is carried along by the gas which escapes to the outside when excess pressure occurs, and further to ensure that the cell is not accessible to the air of the atmosphere until put into operation.

According to the invention there is provided a galvanic air depolarized cell with a zinc electrode and a carbon electrode at which air depolarization occurs and an interposed absorbent separator containing an alkaline electrolyte, wherein the carbon electrode has an absorbent layer thereon over which is a metal cap provided with holes covered by a foil, which foil is removed to expose the holes during use, a sealing ring around the edges of the carbon electrode, cap and foil preventing the leakage of electrolyte and forming an integral assembly, the internal face of the sealing ring away from the cap having an external shoulder part, the assembly being inserted into an

outer metal case containing the zinc electrode so that the separator is pressed against the zinc electrode, an absorbent sleeve being provided in the annular gap formed between the sealing ring and metal case, the gas evolved at the zinc electrode being stripped of electrolyte by the sleeve and allowed to escape between the sealing ring and metal case.

With the above construction the foil must be removed before the cell is put into operation, and by the removal of the covering foil atmospheric air is allowed access to the carbon electrode. The alkaline electrolyte contained in the electrolyte-absorbent separator cannot pass between the carbon electrode and the sealing ring. Further the zinc electrode or pressed zinc powder, which is accommodated in the interior of the metal case, encloses the electrolyte between itself and the carbon electrode in the sealing ring so that the case encloses the sealing ring and the absorbent sleeve. The absorbent material may advantageously consist of absorbent gas-permeable cellulose material. The sealing ring may be provided with fine axial longitudinal channels, at the places where it contacts the metal case. In the event of any considerable formation of gas in the cell when it is put into operation or stored, the gas escapes into the chamber provided with the absorbent sleeve. In the said chamber the gas is freed of any adherent electrolyte particles by absorption and passes through the fine longitudinal channels, between the sealing ring and the outer wall of the case, into the atmosphere. By adopting a suitable construction for the fine axial longitudinal channels and the selection of a suitable absorbent material, the emergence of the gas through the absorbent sleeve commences at such a slight excess pressure that it is practically impossible for electrolyte to penetrate the carbon electrode. In case electrolyte is forced through the carbon electrode together with the gas, the absorbent layer absorbs the electrolyte and prevents its emergence through the air vents in the cap to the outside, thus also preventing, *inter alia,* the corrosion of the contact surface when the covering foil is removed. When the cell is in storage and before it is put into operation, no electrolyte can emerge through the air vents, since they are covered over by the foil. Since the separate parts of the cell can be made in automatic machines and then combined into assemblies, the entire sequence of operations can be automated, including the final assembly and the electrical testing. When the sealing ring of a thermoplastic such as polyethylene is moulded around the carbon electrode, this provides a mechanically strong assembly which can be easily built into the cell. The covering foil likewise moulded into the sealing ring and covering over the air vents ensures that the cell can be stored for a considerable period.

In order that a clear understanding of the invention may be obtained, reference will now be made to the accompanying drawing which shows in cross-section, a preferred form of cell according to the invention.

As shown, the cell consists of an electrode 1 of pressed zinc powder and of an oxygen-permeable carbon electrode 3, between which is an electrolyte-absorbent separator 2 which carries the alkaline electrolyte. The carbon electrode 3 is covered with an absorbent layer 7 which can be of paper, over which is a metal cap 5 which is apertured, and covering foil 6 which can be of plastics. A sealing ring 4 is hermetically moulded around the electrode 3, layer 7, cap 5 and foil 6 and forms a constructional assembly. The zinc electrode 1 is located in the interior of two metal cups 8 and 9, forming a closure, which are connected together, the walls of which are mounted over the internally and externally recessed open side of the sealing ring 4, and which enclose an absorbent sleeve or ring 10. The outer edge of the outer metal cup 9 is lightly spun over a chamfer or shoulder on the sealing ring 4, in order to secure it. The ring 4 also has fine axial longitudinal channels where it rests against the walls of the closure.

WHAT WE CLAIM IS:—

1. Galvanic air depolarized cell with a zinc electrode and a carbon electrode at which air depolarization occurs and an interposed absorbent separator containing an alkaline electrolyte, wherein the carbon electrode has an absorbent layer thereon over which is a metal cap provided with holes and covered by a foil, which foil is removed to expose the holes during use, a sealing ring around the edges of the carbon electrode, cap and foil preventing the leakage of electrolyte and forming an integral assembly, the internal face of the sealing ring away from the cap having an external shoulder part, the assembly being inserted into an outer metal case containing the zinc electrode so that the separator is pressed against the zinc electrode, an absorbent sleeve being provided in the annular gap formed between the sealing ring and metal case, the gas evolved at the zinc electrode being stripped of electrolyte by the sleeve and allowed to escape between the sealing ring and metal case.

2. A cell in accordance with Claim 1, wherein the sealing ring is moulded from a thermoplastic material such as polyethylene.

3. A cell in accordance with Claim 1 or 2, wherein the covering foil comprises a thermoplastic material which seals the cap.

4. A cell as claimed in Claim 1, 2 or 3, wherein the metal case comprises two cups

of different diameters connected together the one in the other so as to present concentric walls forming a recess in which the part of the ring and sleeve are received, the outer wall extending up and being spun over the top of the sealing ring.

5. A cell in accordance with any one of the preceding Claims, wherein the absorbent layer consists of an absorbent paper.

6. A cell in accordance with any one of the preceding Claims, wherein the absorbent sleeve consists of an absorbent, gas-permeable cellulose material.

7. A cell in accordance with any one of the preceding Claims, wherein the sealing ring is provided with fine axial longitudinal channels or grooves where it contacts the outer wall of the metal case.

8. Galvanic air depolarized cell substantially as herein described with reference to the accompanying drawing.

KINGS PATENT AGENCY LIMITED.
By
B. T. King, A.I. Mech. E.,
Director,
Registered Patent Agent,
146a, Queen Victoria Street, London, E.C.4.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1970.
Published by the Patent Office, 25, Southampton Buildings, London W.C.2, from which copies may be obtained.

1178859 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale